Translation Stage Resolution

Theoretical Translational Resolution of Motorised OpenScope Stage

Mechanism

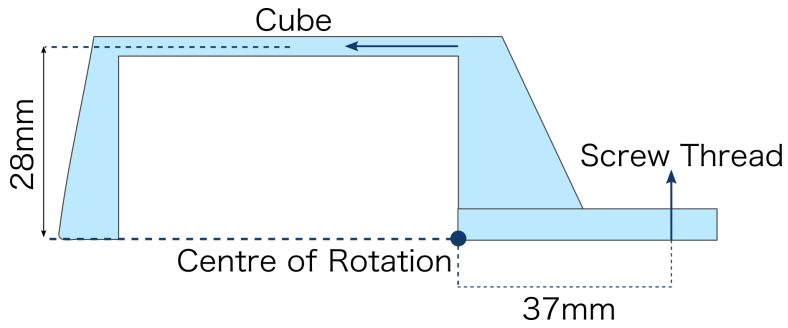
The pivot point of the flexing lever, which allows for movement of the stage, is located at the bottom of the leg, where the stage attaches to the chassis body. Screws and nuts, glued to it, are used to flex the arm.

Distances

Stage centre - centre of rotation: 28mm height

Screw (nut) - centre of rotation: 37mm lateral

Thus the lever arm is 28/37=0.76



Stepping Resolution

M4 screws have a pitch of 0.7mm. The stepper motors we are using have 512 steps per revolution, so the smallest step is 1/512 of a full revolution. Therefore 1 step along the screw corresponds to a movement down of 0.7/512 mm, and so the corresponding translational movement of the stage is

$$0.76 \times \frac{0.7}{512} \approx 1.0\mu m$$

We have found that for most purposes of imaging, it is adequate to command the motors to move 10 or more steps, which correspons to moving the frame of view by 10μm or more.

Z axis

The z-axis is movement is controled via a simple screwing mechanism, using the same type M4 screws. As there are no flexures involved, the resolution is dependent on the screw only:

$$\frac{0.7mm}{512} \approx 1.4\mu m$$